

# **CRYOGENIC EXPERTS, INC.**

World Wide Web <http://www.cexi.com> E-mail [cexi@cexi.com](mailto:cexi@cexi.com)

Toll Free 1-800-FOR CEXI

Phone (805) 981-4500

Facsimile (805) 981-4501



## **Installation And Operating Instructions Model GFFCWB 6 x 8 x 16 Cexi Job No. 970204**

### **I. Installation Instructions**

- A. Install the unit on a level concrete base and anchor to the concrete
- B. Be sure to leave at least 36" clear on all sides of the boiler skid for access and to meet local code requirements.
- C. Connect the liquid CO<sub>2</sub> connection to the inlet connection on the vaporizer. Connect the CO<sub>2</sub> gas connection to the outlet connection on the vaporizer. It is advisable that pressure relief valves be installed in the CO<sub>2</sub> piping wherever there is a possibility of trapping liquid CO<sub>2</sub>.
- D. Connect the natural gas supply line to the regulator on the inlet of the boiler gas train. The required natural gas supply pressure is 1 psig.
- E. Leak check all lines at 1.25 times max. operating or design pressure with nitrogen prior to putting the unit into service to be sure that the system is leak free.
- F. Connect a 460 vac, 60 cycle, 10 amp service to the top of the circuit breaker located in the main control panel on the water bath vaporizer. Follow all local codes and N.E.C. for proper wiring methods. It is recommended that all electrical connections be made through the bottom of the electrical box to keep water from leaking into the box.
- G. Fill the system with water and open all water valves. The system should be turned on and the pump rotation checked. Bleed the system of air. This is a tedious process and may require that the relief valves be removed to insure that all the air is removed from the system. If all the air is not removed from the system, the differential pressure switch may not operate properly. This will keep the unit from allowing the CO<sub>2</sub> to flow through the system. Check the motor load amperage and be sure that the motor load amperage is within the range listed on the motor nameplate.

- H. Turn on the natural gas to the boiler and bleed the system up to the first shut off valve.
- I. Turn on the CO<sub>2</sub> to the system. It is generally advisable to fill the system with gas from the top of the tank to prevent dry-ice from forming in the piping on initial pressurization.
- J. The system is now ready to put into operation.
- K. The unit is equipped with dry alarm contacts in the boiler that can be wired back to the control room. The alarm contacts are non powered and are good for 5 amps at 120 vac.

## **II. Operation**

- A. General Description - The unit consists of two main components. The first is the boiler. The boiler is a large water heater and is used to heat the water that is used to vaporize the CO<sub>2</sub>. The boiler utilizes natural gas as the fuel that is burned to heat the water. The boiler has several safety devices that are used to keep the boiler operating within safe limits. The safety devices are as follows;

- 1.) High temperature cut off switch for monitoring water temperature
- 2.) Temperature control for maintaining the water temperature at desired set point
- 3.) Low water level alarm
- 4.) Loss of flame safeguard unit

The second component is the vaporizer. This unit is designed to vaporize and heat the liquid CO<sub>2</sub>. The unit is designed to allow the CO<sub>2</sub> to flow only when all of the control devices and sensors are satisfied. The system requires that water be flowing through the vaporizer shell at all times when CO<sub>2</sub> is flowing. The system has the following safety devices;

- 1.) Water Flow Sensor - senses the water flow through the vaporizer by means of a differential pressure switch.
- 2.) Low Water Temp Sensor - senses the water temp exiting the vaporizer. If the water temp exiting the vaporizer is below the set point, the temp sensor will shut off the solenoid valve supplying CO<sub>2</sub> to the vaporizer. The set point should be 55<sup>0</sup>F.
- 3.) Low Gas Temp Sensor - senses the CO<sub>2</sub> gas temp exiting the vaporizer. If the gas temp exiting the vaporizer is below the set

point, the temp sensor will shut off the solenoid valve supplying CO<sub>2</sub> to the vaporizer. The set point should be 25<sup>0</sup>F.

- B. Turn on the circuit breaker on the control panel.
- C. Turn on the ON OFF switch to the unit.
- D. Verify that water is flowing through the unit.
- E. Turn on the CO<sub>2</sub> to the unit. Note: This is generally best done in two steps. Fill the system with gas from the top of the CO<sub>2</sub> storage vessel. Then turn on the liquid supply to the unit. This will prevent the formation of dry ice in the piping. The dry ice formations can cause extremely high pressure which can cause damage in the piping and valving.
- F. In the event that the water or gas temperature drops below the set point on the controller the CO<sub>2</sub> solenoid will close and stop the flow of CO<sub>2</sub> through the unit.

### **System Specifications**

Model	GFFCWB 6 x 8 x 16/LTCO
Fluid	CO <sub>2</sub>
Flow	6000 lb. per hour
MAWP	
Shell	100 psig
Tubes	500 psig
Operating Pressure	300 psig
Pressure Drop	15 to 20 psig at full rated flow and 300 psig/70 <sup>0</sup> F
Water Flow	120 gpm
Water Temperature	
Minimum	140 <sup>0</sup> F
Maximum	170 <sup>0</sup> F
Pump Horsepower	3
Voltage	460 ( motor is dual voltage)
Amperage	3.6
Hertz	60
Boiler Horse Power	27.2 (net)
Boiler Gas Supply	1 psig
Boiler Gas Consumption	1140 cubic feet per hour
Temperature Controller Set Points	
Low Water Temperature	50 <sup>0</sup> F
Low Gas Temperature	30 <sup>0</sup> F
High Water Cut Off	180 <sup>0</sup> F
Start Boiler Temperature	140 <sup>0</sup> F

Stop Boiler Temperature

155<sup>0</sup>F